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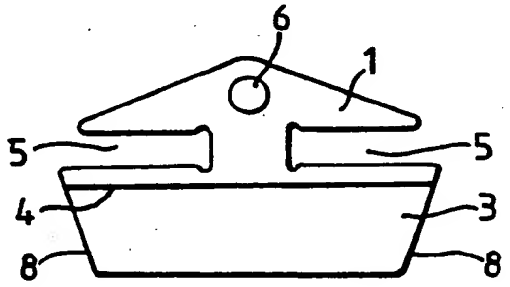
(54) **A composite driving belt with transverse elements provided with mutual coupling means.**

(57) A driving belt of substantially trapezium-shaped cross section for application on V-shaped pulleys, comprising an endless carrier in the form of at least one metal band and a pluarilty of transverse elements abutting against each other with the head sides and slidably mounted on the carrier. The transverse elements are bevelled radially inwardly underneath a tilting line (4) for enabling the bending of the driving belt. For mutual centering the transverse elements are provided with coupling means in the form of (a) projection(s) (6) and (a) recess(es) (7) at the head sides. These coupling means are situated at a relatively large distance above the tilting line of the transverse elements.



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A composite driving belt with transverse elements provided with mutual coupling means.

The invention relates to a driving belt of substantially trapezium-shaped cross section for application on V-shaped pulleys, comprising an endless carrier in the form of at least one metal band and plurality of transverse elements abutting against each other with the head sides and slidably mounted on the carrier, said transverse elements being bevelled radially inwardly (underneath the neutral line of the belt) for enabling the bending of the driving belt whereby the transverse elements contact each other through a tilting line where the bevel passes into parallel parts of the two head sides, said transverse elements being fitted with coupling means in the form of at least a projection at one head side and a substantially corresponding recess at the other head side.

Such a driving belt in which the power substantially is transmitted by pushing forces between the transverse elements, is known e.g. from U.S.patent 3,949,621 (Figs. 1 and 5). Said projections resp. recesses serving for centering the transverse elements relative to each other.

Such a centering may be desirable for preventing the transverse elements in the straight parts of the driving belt from shifting relative to each other.

However, it has been established experimentally that a slight mutual shift possibility of the transverse elements is desired as long as the transverse elements are present in situ of the pulley, since each transverse element should have the freedom to be clamped optimally between the sheaves of the pulley. Also in the parts of the belt between the pulleys had to be a slight shift possibility in case of (slight) alignment errors of the pulleys, such as those which occur in particular with pulleys the mutual distance between the conical sheaves of which is changed for varying the transmission ratio. The pulleys then do not lie exactly in one flat plane, so that a kind of tortion may be occur in the driving belt.

It is the object of the invention to provide a driving belt with transverse elements provided with coupling means in the form of projections resp. recesses, whereby on the one end a proper mutual centering of the elements is effected, while on the other end the transverse elements are adapted to shift sufficiently in relation to each other.
To this effect according to the invention, the projections resp. recesses are disposed at a relatively large distance above the tilting line of the transverse element. Thus the mutual coupling of the transverse elements remains completely operative in those parts of the driving belt that are in a straight condition, but as soon as a slight bending of the driving belt takes place, i.e. the transverse elements are tilting relative to each other, during which they remain in mutual contact through the tilting line, the projections and recesses come fully out of engagement so that the mutual centering of the transverse elements is eliminated.
The belt being tensioned around the pulleys includes straight parts between the pulleys and curved parts which are in contact with the pulleys. In the straight parts the parallel surfaces of the head sides of two abutting transverse elements contact each other, so the coupling

means are in engagement. In the curved parts of the belt two abutting transverse elements are tilting in respect of each other, so there is no engagement of the coupling means.

When running the belt there will not be an abrupt change from the straight parts of the belt to the parts of the belt being in contact with the pulleys and having a curvature corresponding to the running diameter of the respective pulley. Before coming in contact with the pulley there will already be a slight tilting of two abutting transverse elements and also a slight tilting takes place after the transverse elements coming out of contact with the pulley before reaching the straight part of the belt. In the construction of the belt according to the invention there will be a complete disengagement of the coupling means at a slight tilting of two abutting transverse elements as it occurs on both ends of the straight parts of the belt before respectively after the pulleys contact the transverse elements. As mentioned before such disengagement is of importance in case of alignment errors of the pulleys in which case the straight part of the belt and the part of the belt being in contact with the pulley are not lying exactly in the same flat plane.

Preferably according to the invention, the product of the distance between the tilting line and the projections resp. recesses and the thickness of the transverse element (= distance between the parallel parts of the two head sides of each transverse element), both measured in mm, is larger than 3. Bending the driving belt at a given radius, the extent of mutual tilting of successive transverse elements will depend on the thickness of the transverse elements. With thinner transverse elements, the tilting will be less, so that a larger distance is required between the projections resp. recesses and the tilting line in order to bring the coupling means during slight bending out of engagement. Naturally, said distance also depends on the bending radius but it has been found experimentally that the influence of

the running diameter of the driving belt in the pulley is of minor importance and that said general rule is adaquate.

The invention furthermore relates to a transverse element as applicable in the above mentioned driving belt according to the invention and described in the claims.

Some embodiments of the invention will now be described, by way of example, with reference to the accompanying drawing.

The drawing shows three embodiments of transverse elements which are shown in Fig. 1 and 2;3 and 4;5 and 6, respectively in front view, and side view. Corresponding parts are indicated in the various embodiments with identical reference numerals.

The transverse element according to Figs. 1 and 2 is of the type as described e.g. in Swiss patent 256,918 (Figs. 6 and 7) and German Offenlegungsschrift 2,414,989. The transverse elements therein are pushed in lateral direction on the carrier. The transverse element is fitted with two head sides 1,2, which come into contact with the head sides of successive transverse elements when assembly on the carrier has taken place. Head side 1 is provided with a bevel 3. The transition between the part of head side 1 parallel to head side 2 and the bevel 3 is formed by a roll-off zone or tilting line 4. During the bending of the driving belt the transverse elements are in contact with each other through said tilting line 4.

The transverse element is provided with a recess 5 for receiving the carrier, which for example may comprise one or more endless metal bands.

Furthermore the transverse element is fitted with coupling means in the form of two projections 6 on head side 1 and two corresponding recesses 7 in head side 2. In successive transverse elements the projections 6 enmesh in the recesses 7 of the abutting transverse element, in a straight part of the driving belt, so that a mutual

centering of the transverse elements is effected.

The thickness of the transverse element is indicated by d, and the distance between projection 6, resp. recess 7 and the tilting line 4 is indicated by h.

According to the invention the distance h should be sufficiently large in order to eliminate the centering effect as soon as the driving belt is bent, i.e. abutting transverse elements will slightly tilt relative to each other. It has been found experimentally that the magnitude of h should at least be such that h x d, both expressed in mm, is larger than 3, e.g. at a thickness of the transverse elements of 2 mm, distance h should consequently be larger than 1,5 mm. To thinner transverse elements pertains a larger distance h.

Figs. 3 and 4 show an embodiment of a transverse element of the type as described in U.S. patent 3,949,621 (Fig.1) and U.S. patent 4,080,841 (Fig. 3). The driving belt therein is provided with a carrier comprising two endless bands or band packages, which on either side are pushed in recesses 5. During the use of the driving belt, the bands or band packages are prevented from laterally sliding out of the transverse elements by the conical sheaves of the pulley in which the driving belt runs.

Also in this embodiment there is a substantial distance between the tilting line 4 and the projection 6 resp. recess 7.

The transverse element shown in the embodiment according to Figs. 5 and 6 is of the type as described in U.S.patent 3,720,113. The carrier, in the form of an endless band or a band package, is pushed from above into the recess 5 of the transverse element, after which the lips 9 are bent in the position shown.

CLAIMS

1. A driving belt of substantially trapezium-shaped cross section for application on V-shaped pulleys, comprising an endless carrier in the form of at least one metal band and a plurality of transverse elements abutting against each other with the head sides and slidably mounted on the carrier, which elements are bevelled radially inwardly (underneath the neutral line of the belt) for enabling the bending of the driving belt whereby said transverse elements contacting each other through a tilting line where the bevel passes into parallel parts of the two head sides, said transverse elements being fitted with coupling means in the form of at least one projection at one head side and a substantially corresponding recess at the other head side, characterised in that the projections, resp. recesses lie at a relatively large distance above the tilting line of the transverse element.

2. A driving belt according to claim 1, characterised in that the product of the distance between the tilting line and the projections, resp. recesses and the thickness of the transverse element (distance between the parallel parts of both head sides), both measured in mm, is larger than 3.

3. A transverse element for a driving belt according to any one of the preceding claims, of which at least one of the head sides is bevelled underneath the tilting line for enabling mutual tilting of abutting transverse elements, furthermore provided with one or more projections on a head side and substantially corresponding recesses at the other head side, characterised in that the projections resp. recesses lie at a relatively large distance above the tilting line.

4. A transverse element according to claim 3, characterised in that the product of the distance between the tilting line and the projections resp. recesses and the thickness of the transverse element, both measured in mm, is larger than 3.

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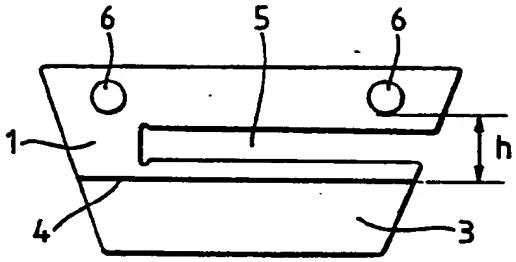

Fig.1.

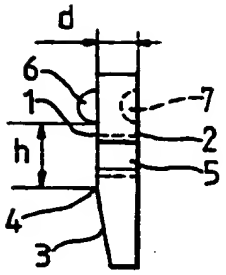

Fig.2.

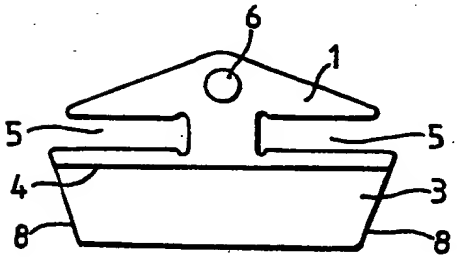

Fig.3.

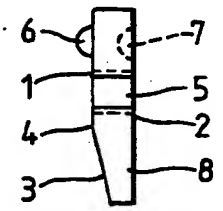

Fig.4.

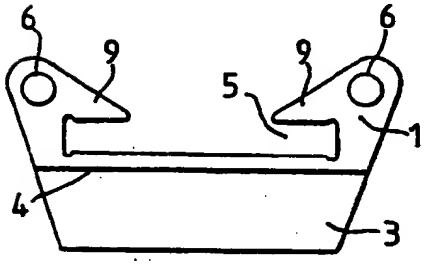

Fig.5.

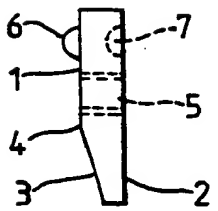

Fig.6.

European Patent Office

EUROPEAN SEARCH REPORT

Application number
EP 80 20 0015

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	DE - A - 1 960 350 (VW) * Page 4, lines 9-10; figures 1,2 * --	1,3
D,A	US - A - 3 949 621 (VARITRAC) * Figures 1-3 * --	1
A	DE - A - 2 557 724 (TIPPMANN) * Claim 1; figures 1-3,10 * ----	1

CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

F 16 G 5/16

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

F 16 G
F 16 H

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24-03-1980	SIGWALT

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